OPERATIONS ON THE SPINAL COLUMN.*

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OPERATIONS upon the spinal column have been numerous, but they have been mainly for the purpose of getting within the spinal canal rather than as operative procedures upon the spine itself. The clinical picture presented by pressure on the spinal cord, whatever the cause may be, is always of the greatest interest. This, I fear, has more or less diverted our attention from a proper consideration of the external aspect of the column, and we have failed to realize that it is the seat of changes which demand operative interference. Consider for a moment the anatomical structure of the spinal column. How great is its length, extending as it does from the skull in its upper portion to the coccyx below, a distance in the average adult varying from 65 to 80 cm., or between two and two and a half feet. Think of the number of its component parts each a distinct unit and liable to the changes from trauma and infection as other bones of the human frame. Look at the great number of joints which are present, which are of two characters, both arthrodial and amphiarthrodial. While their individual amount of motion is extremely small as compared to many other joints of the body, nevertheless, they are prone to many of the changes which cause serious trouble in other articulations. Each individual vertebra is attached to its neighbor by five sets of ligaments, and these are peculiarly susceptible to certain forms of infection, as those produced by the gonococcus. The normal elasticity of the ligament is diminished and a semi-calcareous strand takes its place. After traumatism these ligaments may be pulled away from the vertebral bodies stripping off portions of the periosteum, and form exostoses

* Read before the American Orthopedic Association, May 9, 1907.

of greater or less dimensions. These exotoses may be anatomically situated so as to interfere with the normal motion of the spine and cause pain by impingement of the nerve roots as they emerge from the spinal column. The point of attachment of muscles or of tendons has always been a seat of injury following violent traumatism or strain. The periosteal covering of the bones at these points is injured and permanent damage is often done. When one considers the large number of muscles that are attached to the spinal column throughout its extent, and how very small is the surface of the vertebra free from such muscles, is it surprising that under constant strain which the continual motions of the spine necessitate that there are areas of lessened resistance, the starting point of future trouble? Consider again, the relation of the vertebra to important neurological structures, as the cervical, and lumbar plexuses, and the various intercostal nerves. How narrow is the lumen through which these nerves pass, and how closely are they pressed by the numerous ligaments which hold the adjacent vertebræ together! Proliferations of the edges of these inter-vertebral articulations press directly on them. The contiguity of the nerve elements to the bony structure of the spine offers opportunity for nerve lesions, which have in many cases been put down to a true inflammatory neuritis.

The radiograph has marked a distinct advance in our knowledge of the congenital defects in the spine, and of its numerous variations from the normal which often have a clinical significance. Spina bifida is well known. This is caused when the laminæ of a particular vertebra fail to coalesce. It presents, however, such gross external appearances that the radiograph was not necessary to determine its embryological origin. The small variations, however, resulting in most painful though often obscure symptoms have been brought to light only since the routine use of the X-ray. Thus far has our knowledge concerning the cause of symptoms referable to the brachial plexus been cleared up. Numerous instances of the presence of a cervical rib, or ribs, unilateral or bilateral, are now of such common occurrence that no further mention need be made of

them, but the fact that certain types of neuralgia are due to the pressure of the cervical ribs directly on the plexus has led to the excision of this anatomical variation with complete cure of that group of cases which has for so long a time defied therapeutic remedies. The cervical portion of the spine is the main location of the extra rib, but it is by no means confined to this area. Any of the lumbar vertebræ may possess a rib. Generally when this occurs it is the first lumbar vertebra which is involved and symptoms of pressure on the lumbar plexus result from it, and the cause of these symptoms would be almost impossible to make out unless a radiograph were taken. Any of the five lumbar vertebræ may possess such an appendage, and one of the cases which is the cause of this paper had an extra rib coming off of the fifth lumbar vertebra extending down into the pelvis and was densely adherent to the lumbar sacral cord. It produced a sciatica which defied all kinds of therapeutic treatment for years. Besides the presence of extra ribs other malformations are often met with. Indeed the spinal column has probably more variations from the normal than any other bony structure of the human body. Often the different centers of ossification of the body of the vertebra fail to fuse and the vertebral body remains in two parts between which there is a cleft going directly down to the spinal canal. At times the two sides of the vertebra differ materially in size. It is claimed by some that lateral curvature is due to this asymmetrical development. From Mall's statistics on the embryo one is surprised how often there is a variation from the normal in regard to the number of vertebræ present. Besides the variation in number Böhm before this society at its meeting last year pointed out that the ribs while the same in number on both sides of the spinal column were often asymmetrically placed, that is, the ribs on one side of the spine might often be one vertebral body higher than those on the opposite side. This leads to a great many variations in regard to body development. Instead of one rib springing from each side of the dorsal vertebræ two may come off of one side while one comes from the other. This confinement of two ribs within

a restricted space at their point of origin may cause both sensory and motor disturbances as they press upon the emerging nerves.

Trauma is another cause of certain conditions in the spine which at times necessitate operative interference for the alleviation of their symptoms. We operate on fractures of the spine in order to remove the fragments causing pressure on the cord or on the nerves after they have passed through the spinal column. A rupture of the ligaments and the tearing of muscles cause periosteal thickening and fibrous and bony enlargements which impinge upon neurological structures, or press so hard upon neighboring bony projections with the least movement of the spine that they must be removed before permanent cure will result. Another and probably the most important cause of changes in the spinal column where operation is indicated for the relief of symptoms is the various infectious processes and metabolic disturbances. The gonococcus is the organism most often found in the production of these changes. The organism probably attacks the ligament or the periosteum at the edges of the vertebra. The structures undergo the changes commonly seen in gonococcal infection, namely, fibrous thickening and at times calcification. If the periosteum is involved a true exostosis may be formed and the normal motion in the spine brings these exostoses in contact one with another, or with some projecting bony prominence so that a deep-seated pain is produced. Let me recite a case of gonococcal infection involving both feet as well as the spine.

CASE I.—C. C., age 26. Admitted February 16, 1905. Complains of pains in both heels and pain in the back.

Family History.—Negative.

Previous History.—Three attacks of gonorrhœa, the first ten years ago, the second three years ago, the third one year and three months ago. Associated with a posterior urethritis. With the second attack he had a suppurating inguinal bubo. No history of rheumatism, typhoid fever, or pneumonia.

Present Illness.—Began one year ago; that is, three months after his attack of gonorrhœa. It began in both heels simul-

taneously. The pain and soreness have continued ever since, but with increasing severity. Six months ago, while at Hot Springs for the pain in his feet, he was taken with a pain in his back. This pain is present, whether he lies down or is walking about. He walks with great difficulty.

Physical Examination.—Not a robust man. Loss in weight during the past year has been fifteen pounds. Right foot shows a decided thickening of the os calcis. At the attachment of the plantar fascia with the os calcis there is a spot of acute tenderness on pressure. This area measures about one centimeter. There are no acute inflammatory symptoms. Stretching of the plantar fascia causes the usual pain. The big toe joint is slightly enlarged. There is no pain on pressure about the tendo Achillis. The left foot is similar in all respects to the right. Spine painful to pressure along the entire lumbar region, but especially at the junction of the third and fourth vertebræ. Lumbar lordosis is slightly diminished. There is a slight bending of the body to the right. Some pain is referred to the right sciatic region. Hyperextension of the spine is impossible. Bending to the left is restricted more than bending to the right.

Operation.—Incision along the outer border of the os calcis was made. The exostosis was removed, and with it the tissue immediately adjacent. The plantar fascia was adherent to the underlying adipose tissue in places.

Radiograph.—Small exostosis at attachment of flexor brevis digitorum to os calcis. Slight thickening of os calcis. Radiograph of the back shows two exostoses approaching one another between the third and fourth lumbar vertebræ (Figs. 1 and 2).

Bacteriological Report.—Cultures were negative. Plantar fascia showed evidence of an acute inflammatory process, with round-cell infiltration and an increase in blood-vessels. Sections stained for organisms show the presence of a biscuit-shaped coccus, which is the size and shape of the gonococcus.

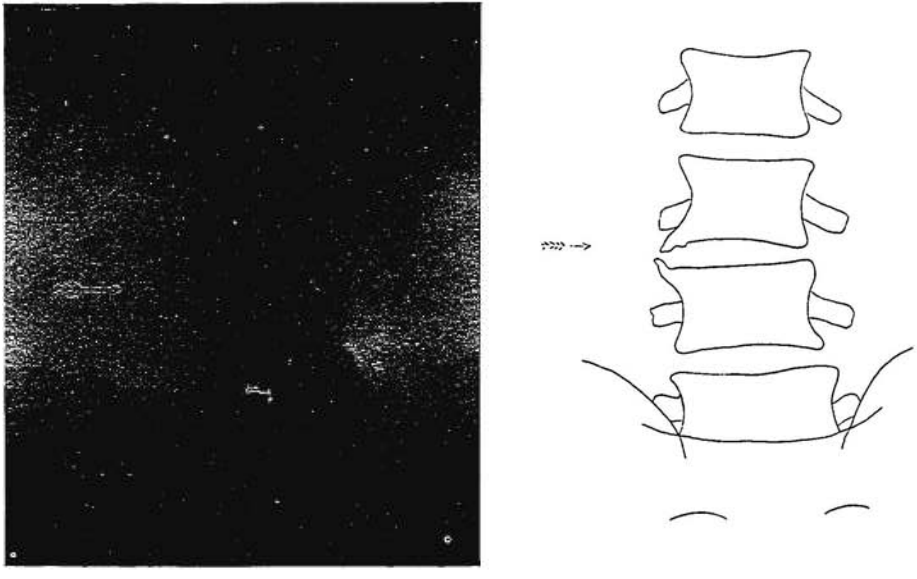
Result.—Three months after the operation, patient reports that the pain in his heels has entirely disappeared. He is still wearing a spinal support for the arthritis of the back. He is attending to his business for the first time in more than a year.

Here we have the production of an exostosis on the inferior surface of the os calcis, which when removed showed the

FIG. 1.

CASE I.—Gonorrhœal exostosis of os. calcis.

FIG. 2.



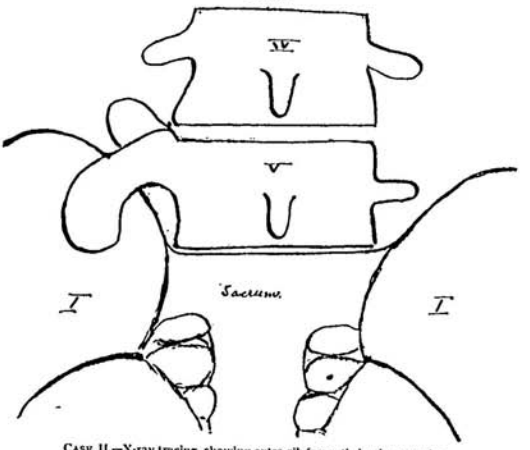
CASE I.—Gonorrhœal exostoses of the spine.

presence of the gonococcus in the tissue. The radiograph of the spine shows two prominent exostoses following the course of the lateral ligament. One springs from the inferior border of the third lumbar vertebra, and the other from the superior border of the fourth lumbar vertebra. As the spine undergoes lateral bending it is easily seen how these two exostoses come in contact one with another and produce the pain complained of. As the gonococcus was the organism found in the exostosis of the heel, and as the attack of pain in the back came on shortly following the trouble in the heel it is is fair to assume that it was also the etiological factor of the exostosis in the spine. As long as the patient wears a light support which prevents lateral motion in the lumbar region he is perfectly comfortable. As soon as he discontinues its use the pain returns. The rational treatment would be to remove these exostoses in the spine, but as the brace affords perfect relief the patient is loth to undergo further operative measures. Not only a gonococcus can cause such formations upon the spine, but also other organisms, as the tubercle bacillus and the typhoid bacillus, and the cases of both of these infections resulting in changes in the contour of the spine have been reported.

Besides those cases known to be of infectious origin we have the cases of osteoarthritis of the spine. These cases are probably due to metabolic disturbances. They may involve a large area of the column or there may be some localized focus which one can usually remove. They are generally found in the lumbar or cervical region, that is wherever a considerable degree of motion is allowed. Often these cases are associated with other constitutional disturbances, as the presence of gall stones, or of renal calculus. Unfortunately when the new bony deposits have been laid down they do not respond to medication as the two conditions just mentioned. I have brought up the subject to-day in order to show that whatever be the etiological factor in these cases, whether congenital deformities, anatomical variations, traumatism, infectious processes, or metabolic changes, the spinal column is a legitimate

field for operation in certain cases which can be definitely pointed out by means of the radiograph. No other treatment will produce satisfactory and permanent results. In this connection I should like to report two cases where operative treatment was instituted with perfect recovery of the patient. In the case which we will call No. 2 we have the presence of a rudimentary rib springing from the left side of the fifth lumbar vertebra. It passed down into the pelvis, was inti-

FIG. 3.



CASE II.—X-ray tracing, showing extra rib from 5th lumbar vertebra.

mately bound to the lumbar sacral cord and was the cause of a sciatica which had been so persistent and so severe that the girl had been practically an invalid for the past five years. This rudimentary rib was removed by operation and thereby the pressure on the nerve removed, and since that time she has been perfectly free from pain and goes about as any normal person. The history is as follows:

CASE II.—E. B., white, female; age 22, referred to me by Dr. Thayer on August 22, 1906, and was admitted to the Johns Hopkins Hospital. She complained of sciatica.

Family History.—Negative.

Previous Illness.—There were the usual diseases of childhood, with no acute illness.

The Present Illness.—Duration five years. There was gradual onset with excruciating pain referred along the course of the left sciatic nerve, going down as far as the foot. The pain was so intense that she was confined to her bed for nine months. Later she was able to be about on crutches. There would be periods when the pain was less severe than at other times, but it was always present to a marked degree. The pain became very much worse again seven months ago, since which time she has been practically confined to her bed, the least motion tending to aggravate the condition. All the usual remedies have been applied. The galvanic current has been used without effect. The leg has been packed in ice and also put in extension. Injections of chloroform have been made directly into the sciatic surfaces only to aggravate the trouble. Four years ago the uterus was suspended, thinking that it might possibly be exerting some pressure on the nerve in question.

Physical Examination.—She is rather a thin girl, somewhat anæmic, hæmoglobin being 79 per cent. There is no glandular enlargement. Heart and lungs negative. The abdomen is negative except for some soreness on pressure in the left side of the umbilical region. The patient lies in bed with the leg flexed at 45°. The knee jerks are slightly exaggerated. There is intense pain on pressure over the lower lumbar region on the left side and also over the sciatic nerve as it emerges beneath the gluteus muscle. The pain is elicited on pressure behind the trochanter as well as in the popliteal space. All motions of the leg are carefully guarded. As the patient cannot stand it is impossible to test the flexibility of the spine. There is an atrophy of the thigh of 2 cm. and 1 cm. of the calf.

The Radiograph Examination.—This shows a rudimentary rib about one and three-quarter inches in length springing from the left side of the fifth lumbar vertebra and going down into the pelvis. The rib is of unusual thickness. It articulates with the vertebra in a normal manner. The transverse process is seen pushed somewhat upward (Figs. 3 and 4).

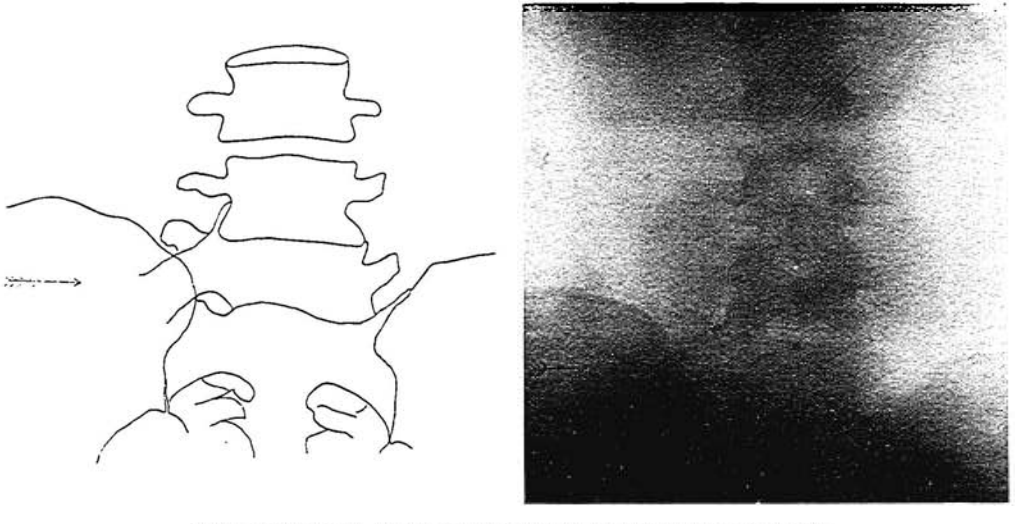
Operation.—The anomaly just described having been pointed out by means of the radiograph and its exact location and dimensions thus being made out, it was decided to operate in order to see whether it did not press directly on the lumbar sacral cord, thus causing the symptoms of sciatica. A vertical incision was made through the skin and fascia along the outer portion of the left lower erector spinæ group. These muscles were retracted inwards, but in order to get a better exposure a slight transverse incision was made into them. The quadratus lumborum was then separated from the erector spinæ group and we came directly down upon the transverse process and the rudimentary rib. One's finger was then inserted under the muscle and the rudimentary rib could be palpated, running down into the pelvis. It appeared to be about 1½ in. or 2 in. long. By probing with the finger within the pelvis the superior portion of the lumbar sacral plexus was found to be closely adherent to the rib along its anterior surface. This was gradually freed with the finger and the rib was excised. The wound was closed entirely, the muscles being sewn with catgut sutures, and the skin with subcutaneous silver wire. A plaster spica was applied. The patient was free from her severe pain almost immediately after the operation, but all of the tenderness did not disappear for three or four weeks. She was able to walk around on a crutch at the end of her third week, and could go about without any support in little more than a month. She is now able to do everything that a normal person can do, and is perfectly free from pain.

The next case, No. 3, is that of a man who had a large exostosis an inch and a half in length extending from the lower border of the third lumbar vertebra and impinging on the side of the fourth lumbar vertebra causing intense pain in the lumbar region.

CASE III.—R. S., male; age 45; admitted to the hospital April, 1906; complains of pain in the lumbar region and radiating into the scrotum. Family history is negative. Previous history of usual children's diseases and gonorrhœa twenty years ago.

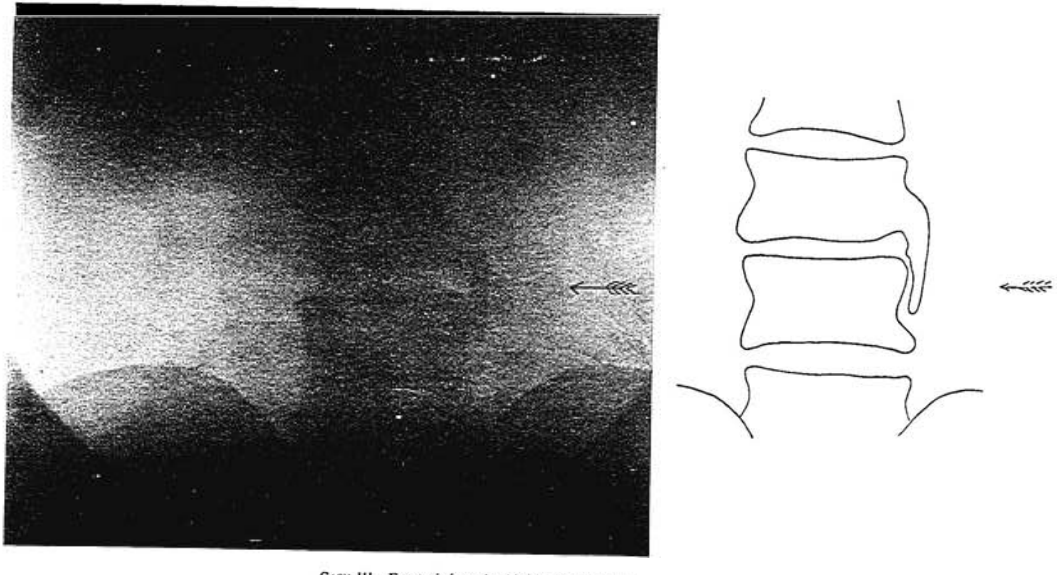
Present Illness.—For the past three years he has had marked pain in the right lumbar region; pain referred down along the right side and also into the scrotum. For the past five months the

FIG. 4.



CASE II.—Rudimentary rib, springing from the fifth lumbar vertebra and extending into the pelvis.

FIG. 5.



CASE III.—Exostosis from the third lumbar vertebra.

symptoms have been more acute, all motion in the lower spine seeming to intensify them, and at times the pain is so severe that he is weakened continually during the night.

Physical Examination.—At the local site of the disease pressure over the lumbar region causes intense pain. Motion of the spine especially in a lateral direction to the right or bending forward or backward is restricted as well as painful. Pain also radiates along the course of the sciatic nerve as far as the knee. The fingers of both hands show a mild grade of Heberden's nodosites. Examination of the ureters shows both to be perfectly patent, but some pus and casts were obtained from the right kidney.

The radiograph shows small calculus in the right kidney and a long finger-like projection of bone about 1½ inches in length, extending along the lower margin of the third lumbar vertebra and passing down along the side of the fourth vertebra. It can easily be seen when one looks at the radiograph how motions are restricted especially as the patient bends toward the right side.

The operation was performed upon the right kidney and a small stone removed. There has been an improvement of the urinary condition and the pain in the scrotum has disappeared. The pain in the back and along the sciatic nerve continued to be so bad that on December 12, 1906, the patient returned for an operation for the removal of the exostosis. This was done by a vertical incision along the outer edge of the right erector spinæ muscle and a small transverse incision into those muscles to afford better exposure. The exostosis shown in the radiograph Fig. 5 was about an inch and a half in length and bound down to the fourth lumbar vertebra by dense adhesions. This exostosis was removed close up to its base. The wound was closed by sewing the muscles together with catgut and the skin with subcutaneous silver wire. Three weeks after the operation the patient was perfectly well, and a letter from him yesterday said that he had had no pain since his operation.

From these three cases we are able to come to certain conclusions—in the first place, that the spine is the seat of numerous affections which differ materially in their etiology.

That these affections simulate the symptoms of other diseases to such an extent that mistakes in diagnosis are fre-

quently made and the patients subjected to therapeutic remedies which cannot be of help to them.

That in cases of persistent sciatica or pain along other nerves a radiograph of the spine should be made to determine whether there is not some point of bony pressure causing the trouble.

That operations on the spine for the removal of these troubles can be made in many cases with perfect ease and safety.

And that operation offers the quickest and most certain mode of treatment in a great majority of such afflictions.